REMARKS

Claims 1 - 28, 30 and 32-60 are pending in the application. Claims 1 - 28, 30 and 32-60 stand rejected. Claim 35 is amended. New claims 61 and 62 are added. No new matter has been added.

Claim 35 is amended to change the word at to the word --to--. The amendment is for the sole purpose of correcting an error clearly clerical in nature and not for the purpose of overcoming a rejection or art of record..

New claims 61 and 62 are added. Support for the claims is found in the application as originally filed at page 7, lines 4-8.

Applicant respectfully submits the following arguments traversing the rejections. The rejections are addressed in substantially the same order as presented in the office action.

35 USC § 103 REJECTIONS

Claims 1-3, 5, 9, 12, 13, 48, 50, 52, 56, and 59 stand rejected under 35 USC § 103(a) as being unpatentable over *Crump et al.* (US 3,911,388) in view of *Wassell* (US 4,779,852). Applicant respectfully submits that the Examiner has not presented a prima facie case for obviousness.

Claim 1 is an originally-presented independent claim that includes the limitation "at least one isolator **coupled to the one or more seismic sensors** for isolating the one or more seismic sensors from high-g shock induced in the housing." Claim 48 is an originally-presented independent method claim for isolating a seismic sensor from high-G shock loads, the claim including the limitation "providing at least **one isolator between the one or more sensors and the housing**."

Applicant resubmits that the '388 reference does not teach the elements as asserted

by the Examiner. In rejecting the claims, the Examiner cites the '388 reference as teaching a housing (Fig. 3, Item 41), a sensor (Fig. 3, Item 51) disposed in the housing, and at least one isolator (Fig. 4, Items 109 and 111) coupled to the one or more seismic sensors for isolating the seismic sensor from vibrations induced in the housing. The Examiner refers Applicant to columns 3 and 7 and admits that '388 fails to teach that the vibrations are high-G shocks. The Examiner has not mentioned other elements and/or arrangements of the independent claims not taught in the '388 reference, so Applicant reasserts these points below.

Applicant has thoroughly reviewed the cited reference, and cannot agree with the Examiner's reading of the '388 reference. **The '388 reference does not teach an isolator coupled to a sensor.** Referring to Figures 3 and 4 and to the description, the '388 clearly teaches an accelerometer unit 51 inside housing 41, which fits snugly but without binding around the curved sides of the unit 51. See column 4, lines 57-61. Since the housing 41 is fitted snugly about the accelerometer 51, then the accelerometer 51 **cannot be isolated from vibrations induced** in the housing 41 as suggested by the examiner, because the vibrations induced in the housing are transferred to the accelerometer 51.

The '388 reference teaches in column 5, lines 23 through 30 a seismic mass in the form of a spherical ball 103. The ball contacts the centers of piezoelectric crystals 95, 97 at center points, and the ball 103 is held in place by rubber rings 109, 111. In column 5, lines 5 through 23 that the crystals 95, 97 are cemented to springs 91, 93 and the springs are mounted on an inner case of the accelerometer unit 51. The reference, further teaches that the rings 109, 111 form part of the springs 91,93. Therefore, the rings form part of the spring-mass portion of the sensor 51, and **it would be incorrect to conclude that the rings 109, 111 isolate the sensor 51 from vibrations as the rings perform a necessary function of the sensor.** Since the rings form a functional part of the sensor, they are not **coupled to a sensor** as Applicant claims in the independent claims.

The Examiner agrees that the '388 reference does not teach isolating the accelerometer 51 from high-g shock induced in the housing 41. The Examiner then asserts that Wassell, referring Applicant to Figure 1A, teaches an apparatus for sensing seismic waves in the earth.

Wassell in column 3, lines 51-54 explain that Figures 1-1A show a vibration isolator and shock absorber assembly positioned at the lower end of a **mud pulse transmitter system within a drill collar**. A mud-pulse telemetry system uses controlled variations in drilling fluid pressure to convey information between uphole and downhole locations. Applicant fails to see the relevance to seismic sensors or to seismic prospecting, and **nowhere does Wassell mention seismic sensors**.

The Court of Appeals for the Federal Circuit has specifically required that there by a teaching or suggestion in the prior art for such a combination.

> See, e.g., *Brown & Williamson Tobacco Corp. v. Philip Morris Inc.*, 229 F.3d 1120, 1124-25, 56 USPQ2d 1456, 1459 (Fed. Cir. 2000) ("a showing of a suggestion, teaching, or motivation to combine the prior art references is an 'essential component of an obviousness holding'") (quoting *C.R. Bard, Inc., v. M3 Systems, Inc.*, 157 F.3d 1340, 1352, 48 USPQ2d 1225, 1232 (Fed. Cir. 1998)); *In re Dembiczak*, 175 F.3d 994, 999, 50 USPQ2d 1614, 1617 (Fed. Cir. 1999) ("Our case law makes clear that the best defense against the subtle but powerful attraction of a hindsight-based obviousness analysis is rigorous application of the requirement for a showing of the teaching or motivation to combine prior art references."); *In re Dance*, 160 F.3d 1339, 1343, 48 USPQ2d 1635, 1637 (Fed. Cir. 1998) (there must be some motivation, suggestion, or teaching of the desirability of making the specific combination that was made by the applicant); *In re Fine*, 837 F.2d 1071, 1075, 5 USPQ2d 1596, 1600 (Fed. Cir. 1988) ("'teachings of references can be combined only if there is some suggestion or incentive to do so.'") (emphasis in original) (quoting *ACS Hosp. Sys., Inc. v. Montefiore Hosp.*, 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984)). The need for specificity pervades this authority. See, e.g., *In re Kotzab*, 217 F.3d 1365, 1371, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000) ("particular findings must be made as to the reason the skilled artisan, with no knowledge of the claimed invention, would have selected these components for combination in the manner claimed"); *In re Rouffet*, 149 F.3d 1350, 1359, 47 USPQ2d 1453, 1459

(Fed. Cir. 1998) ("even when the level of skill in the art is high, the Board must identify specifically the principle, known to one of ordinary skill, that suggests the claimed combination. In other words, the Board must explain the reasons one of ordinary skill in the art would have been motivated to select the references and to combine them to render the claimed invention obvious."); *In re Fritch*, 972 F.2d 1260, 1265, 23 USPQ2d 1780, 1783 (Fed. Cir. 1992) (the examiner can satisfy the burden of showing obviousness of the combination "only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references"). *In re Lee,* 61 U.S.P.Q.2D (BNA) 1430.

Rejected claims 2-3, 5, 9, 12 and 13 depend from claim 1, and rejected claims 50, 52, 56, and 59 depend from claim 48. These dependent claims necessarily include each and every limitation of the corresponding independent claim. Consequently, Applicant respectfully submits that the dependent claims are allowable over the art of record for at least the same reasons as stated above for the corresponding independent claims.

Claims 4, 6, 7, 51, 53 and 54 stand rejected under 35 USC § 103(a) as being unpatentable over *Crump et al.* (US 3,911,388) in view of *Wassell* (US 4,779,852) and further in view of *Carpenter et al.* (US 5,463,193). Applicant respectfully submits that the Examiner has not presented a prima facie case for obviousness.

Rejected claims 4, 6, and 7 depend from claim 1, and rejected claims 51, 53, and 54 depend from claim 48. These dependent claims necessarily include each and every limitation of the corresponding independent claim. The independent claims are discussed above, and Applicant has shown that 1) the '388 and '852 references do not teach each and every element as arranged in the independent claims and 2) **that there is no suggestion or motivation to combine '388 and 852**. Consequently, Applicant respectfully submits that the dependent claims are allowable over the art of record for at least the same reasons as stated above for the corresponding independent claims.

The Examiner takes Official Notice that it is well known in the art to employ

silicone rubber and polyurethane foam as vibration dampers as disclosed by Crump et al. and Carpenter et al. The Examiner concludes that it would have been obvious to those skilled in the art to employ a vibration isolator comprising the materials alone or in combination to increase the vibration damping effect.

Carpenter et al. teach a vibration isolation module for a towed acoustic streamer to minimize vibrations transmission of mechanical vibration from a tow cable to an acoustic array. Applicant respectfully submits, as discussed above, that damping vibrations completely different than isolating a component from high-g shock as claimed. Additionally, there is no teaching in the cited art of isolating from high-g shock using the claimed materials. The vibrations addressed by Carpenter et al. are operation vibrations encountered while towing an array. Consequently, it is improper to use these references and any Official Notice taken therefrom to conclude that the application of the materials to isolating a component from high-g shock is obvious. Applicant further submits that Wassell provides no additional support for combining the materials as claimed in isolating a seismic sensor from high G-shock.

As to claim 7, the art of record does not teach or suggest the claimed first layer of silicone rubber in combination with the second layer of polyurethane foam. The Examiner's official notice does not provide adequate support for the conclusions stated in the action, because the problem associated with blindly combining rubber and foam vibration isolators is that the seismic sensor effectiveness and sensitivity to seismic vibrations will be adversely affected if the incorrect combination is selected. Since the examiner has not provided adequate support for the notice of combining the claimed materials in the claimed layering for the claimed purpose of damping high-G shock for a seismic sensor that should not be adversely affected in the sensor operating band, Applicant respectfully requests that the examiner submit an affidavit under 37 CFR 104(d)(2) providing factual support for the official notice.

Claims 8, 14-16, 18, 20, 24-26, 35-37, 39, 45-47, 49, 55 and 60 stand rejected under 35 USC § 103(a) as being unpatentable over *Crump et al.* (US 3,911,388) in view of *Wassell* (US 4,779,852) and further in view of *Hall Jr.* (US 4, 163, 206).

As to claims 8, 14, 49, 55 and 60, these claims depend from claims 1 and 48

discussed above. Applicant has shown that the '388 reference does not teach using an isolator to isolate a sensor from high-g shock induced in a housing, and the '206 reference does not provide the teaching. Therefore, Applicant submits that dependent claims 8, 14, 49, 55 and 60 are allowable over the art of record for at least the same reasons as stated for the independent claims 1 and 48.

The remaining rejected claims include independent claims 15 and 35. Rejected claims 16, 18, 20, and 24-26 depend from claim 15 and claims 37, 39 and 45-47 depend from claim 35.

Independent claim 15 includes the limitation of at least one isolator coupled to a sensor assembly and to a module case. The '388 reference does not teach an isolator coupled to a sensor assembly and to a module case. As discussed above, **the rings of the '388 reference do not in fact isolate a senor assembly. The rings form part of a spring, but the ball 103 contacts crystals and the springs form part of the accelerometer sensor 51 and perform an integral sensing function and not an isolation function**. Applicant respectfully submits that independent claim 15 is allowable for the art of record, because the limitation of at least one isolator coupled to a sensor assembly and to a module case is not taught or suggested by be any single reference or combination of references of record.

Furthermore, claim 15 clearly claims an inertial mass coupled to a seismic sensor. The inertial mass of Hall Jr. is not **coupled to** a sensor. Hall Jr. clearly states that **the mass 36 is "free to move... in a completely unrestrained manner inside sleeve 48."**. See column 4, lines 37-39. Applicant submits that art of record does not teach or suggest an inertial mass coupled to a sensor assembly. Therefore, independent claim 15 is not obvious in view of the art of record.

Rejected claims 16, 18, 20, and 24-26 depend from claim 15. Consequently, Applicant respectfully submits that dependent claims 16, 18, 20, and 24-26 are allowable over the art of record for at least the same reasons as stated above for independent claim 15.

As to claim 16, the Examiner does not appear to appreciate the compressive force aspect of the claims, because it is not addressed in the rejection. The art of

record does not teach **a module case providing a compressive force t the at least on isolator**.

As to claims 35, 37, 39 and 45-47, Applicant respectfully submits that the Examiner has failed to present a prima facie case of obviousness. Independent claim 35 includes the limitation of **"an isolation layer coupled to the module case and to the sensor assembly, wherein the sensor assembly does not move relative to the module case when an input force of less than a predetermined level is applied to the module case."**

The '388 reference has been discussed in detail. There is no teaching in the '388 reference of an "isolation layer." The **rings 109, 111 taught by the '388 reference do not isolate the sensor 51** as suggested by the Examiner, **because the rings form part of the sensor 51 and perform part of the spring function.** Moreover, **the rings '388 do not constitute a "layer", because the rings allow the mass 103 to contact the crystals 95, 97**.

The Hall reference is cited for it's teaching of an inertial mass, and Applicant cannot find a teaching of an isolation layer in the reference. And as discussed above, the inertial mass of Hall Jr. is free to move in 48. Thus, Hall does not teach or suggest an inertial mass coupled to a module case and to a seismic sensor as claimed in claim 35. Consequently, the combination of Hall and Crump et al. and Wassell does not teach all the limitations of claim 35 as arranged in the claim. Therefore, Applicant submits that independent claims 35 is allowable over the art of record.

Rejected claims 36,37, 39, and 45-47 depend from independent claim 35 and are allowable for at least the same reasons as stated for claim 35.

Claims 10, 11, 57 and 58 stand rejected under 35 USC § 103(a) as being unpatentable over *Crump et al.* (US 3,911,388) in view of *Wassell* (US 4,779,852) and further in view of *Alft et al.* (US 6,315,062).

The '388 reference has been discussed extensively above. Claims 10 and 11 depend from claim 1 discussed above and claims 57 and 58 depend from claim 48 discussed above. The '062 reference teaches a drilling tool with a navigation system employing multi-axis MEMS accelerometers as part of the navigation system. Applicant

can find no discussion of seismic prospecting sensors using MEMS accelerometers in '062, nor does Applicant find a teaching of using an isolator to isolate a MEMS accelerometer from high-g shock. Thus, the combination of '388 and '062 does not teach every element of the rejected claims. Consequently, Applicant respectfully submits that claims 10, 11, 57 and 58 are allowable over the art of record.

Claims 17, 23, and 42-44 stand rejected under 35 USC § 103(a) as being unpatentable over *Crump et al.* (US 3,911,388) in view of *Wassell* (US 4,779,852) and further in view of *Hall Jr.* (US 4, 163, 206) and further in view of *Alft et al.* (US 6,315,062).

Claims 17 and 23 depend from independent claim 15 discussed above, claims 29-31 depend from amended claim 27 discussed above and claims 42-44 depend from independent claim 35 discussed above. Applicant respectfully submits that these dependent claims are allowable for at least the same reasons as discussed above in reference to the independent claims. The combination of references do not teach every element of the independent claim, namely the isolation limitation discussed above. Moreover, Applicant has discussed above that the '062 reference does not teach or suggest MEMS accelerometers for use in seismic sensors, and there is no suggestion in any reference to combine the drilling tool navigation system sensor in '062 with the teaching of '388, '852 or '206.

Claims 19, 21, 22, 38, 40 and 41 stand rejected under 35 USC § 103(a) as being unpatentable over *Crump et al.* (US 3,911,388) in view of *Wassell* (US 4,779,852) and further in view of *Hall Jr.* (US 4,163,206) and further in view of *Carpenter et al.* (US 5,463,193).

Claims 19, 21 and 22 depend from independent claim 15 discussed above, and claims 38, 40 and 41 depend from independent claim 35 discussed above. Applicant respectfully submits that the dependent claims are allowable for at least the same reasons as stated for the associated independent claim.

Furthermore, the layer aspect of claim 21 is discussed above, and the art of record does not teach or suggest the claimed **layer** of isolating material. As to claim 22, the art of record does not teach or suggest the claimed first layer of silicone rubber

in combination with the second layer of polyurethane foam. The Examiner's official notice does not provide adequate support for the conclusions stated in the action, because the problem associated with blindly combining rubber and foam vibration isolators is that the seismic sensor effectiveness and sensitivity to seismic vibrations will be adversely affected if the incorrect combination is selected. Since the examiner has not provided adequate support for the notice of combining the claimed materials in the claimed layering for the claimed purpose of damping high-G shock for a seismic sensor that should not be adversely affected in the sensor operating band, Applicant respectfully requests that the examiner submit an affidavit under 37 CFR 104(d)(2) providing factual support for the official notice.

Applicant reiterates that Carpenter et al. deal with a completely different vibration problem, i.e., mechanical vibration in a towed array induced through a tow cable. And Wassell is likewise directed to a non-analogous sensor and problem, i.e., drilling environment and sensor in a drill collar. Therefore, the '193 reference fails to teach seismic sensor module tolerant to high-g shock inputs as claimed in either claim 15 or 35. Applicant submits that claims 19, 21, 22, 38, 40 and 41 are all allowable over the suggested combination of the '388, '852, 206, and '193 references.

Claims 27, 28, 30 and 32-34 stand rejected under 35 USC § 103(a) as being unpatentable over *Crump et al.* (US 3,911,388) in view of *Wassell* (US 4,779,852) and further in view of *Hall Jr.* (US 4, 163, 206) and further in view of Alft et al. (US 6,315,062).

Independent claim 27 includes an inertial mass **coupled to** a sensor assembly of MEMS accelerometers **for reducing noise in the sensor module**. As stated above Hall Jr. does not couple a mass to a sensor assembly. Furthermore, Hall Jr. does not teach or suggest using an inertial mass coupled to a sensor assembly for reducing noise. The inertial mass in Hall Jr. only provides a tilt determination function.

U.S. patent 6,315,062B1 to Alft et al. Teaches multi-axis MEMS accelerometers for use in a navigation system in s drilling tool. There is **no suggestion in the '062 r f renc to use a MEMS acc lerom t r as a seismic s ns r**. Consequently, the combination is improper in view of the several court decisions cited herein. Therefore,

Applicant submits that independent claim 27, is allowable over all art of record.

Dependent claims 28, 30 and 32-34 depend from amended claim 27 and are allowable over the art of record for at least the same reasons as stated for amended claim 27.

New claim 61 is allowable over the art of record because the art of record does not teach or suggest a housing wall providing having a thickness selected to provide wall flexure for damping high-g shock induced in the housing.

New claim 62 is allowable over the art of record, because the art of record does not teach or suggest the claimed tapered housing wall having a longitudinal ridge to provide a key-type fit when the sensor module is inserted into the ground.

CONCLUSION

For all of the foregoing reasons, applicant submits that the claims are allowable over the prior art of record. A check for the fee associated with the RCE, the added claims and for the petition for an extension of time is submitted herewith, and no other fee is believed due for filing this response. The Commissioner is hereby authorized to charge any additional fee due for this response or credit any overpayment to Deposit Account No. 13-0010 (IO-1058US).

Respectfully submitted,

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Todd A. Bynum, Reg. No. 39,488
Madan, Mossman & Sriram, P.C.
2603 Augusta, Suite 700
Houston, Texas 77057-5638
Tel: (713) 266-1130
Fax: (713) 266-8510
Attorney For Applicants

EXPRESS MAIL CERTIFICATE

I hereby certify that this paper or fee, along with any papers referred to as being attached or enclosed is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10, Express Mail Label No. EL978720716US, on October 27, 2003, Commissioner for Patents, P. O. Box 1450, Alexandria, Virginia 22313-1450.

Beth Pearson-Naul